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EXAMINER

ART UNIT

PAPER NUMBER

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/123,352

Applicant(s)
Yunlong et al

Examiner
Rudy Zervigon

Group Art Unit
1763



☒ Responsive to communication(s) filed on Mar 27, 2000

This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-18 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-18 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s) _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1, 6, 14, 16-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. The term "...dimension(s) of said center axis..." or "...center axial dimension..." in claims 1, 14, and 16 is a relative term which renders the claim indefinite. The term "...dimension(s) of said axis..." is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.
4. Claim 6 is generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors."wherein, when" should just be "when".

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Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-8, 16-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato Noriyoshi et al (JP5-354023 IDS reference). Sato Noriyoshi et al describes an apparatus for plasma assisted operations (abstract). Specifically, Sato Noriyoshi et al describes a plasma generation chamber with the following attributes:

- i. A plasma generation apparatus vacuum vessel (Abstract, purpose) having a plasma generation region formed from a gas inductor (item 8, Figures 1, 3, 5-6, 8) that inducts discharge gas established in the interior thereof (abstract)
- ii. An exhaust (piping from vacuum chamber (item 1, all figures) to "evacuation mechanism", abstract item 7) that exhausts the atmosphere in the interior of the vacuum vessel (item 7, abstract)
- iii. A tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma generation region
- iv. A first high frequency electric power applicator (item 19; "electrode supply mechanisms 10, 11, 12 for supplying power to the discharge electrode...", abstract) that applies high-frequency

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electric power to the tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma volume

- v. A second high frequency electric power applicator (item 77, Figure 7), with resonant circuit (78, figure 7), that applies high-frequency electric power to one (item 72, figure 7) of two walls (items 5, 1; figure 1) fashioned to enclose the plasma volume
- vi. Magnetic force line generator that generates (items 401,402 Figure 5; abstract) magnetic force lines (501-503, figures 1, 2) having portions (at the surface of item 1, Figures 1,2) roughly parallel to the center axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume such that the length of the parallel portions become longer (less curved) the closer the magnetic force lines are to the central axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume (Figure 5)
- vii. Electrically conducting two walls (items 5, 1; figure 1) positioned so as to "sandwich" the plasma generation region, and substrate (item 6, all Figures), between them in the dimension of the center axis of the tube-shaped discharge electrode (item 9, figure 5) fashioned to enclose the plasma volume for defining the scope of the plasma generation region in the center axial dimension
- viii. The other of two walls (item 1, Figure 5) connected to a reference potential
- ix. The other of two walls (item 5, Figure 5) is established in a floating state and used as a holder for holding the object (6, Figure 5) to be treated

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- x. The magnetic force lines fashioned to enclose the plasma volume such that the length of the parallel portions become longer (less curved) the closer the magnetic force lines are to the central axis of the tube-shaped discharge electrode (item 9, Figure 5) fashioned to enclose the plasma volume passing through a center of the plasma generation region.
- xi. magnetic field lines so shaped (Figures 1,2) as not to intersect the electrically conducting two walls (items 5, 1; figure 1) positioned so as to "sandwich" the plasma generation region between them in the dimension of the center axis of the tube-shaped discharge electrode fashioned to enclose the plasma volume for defining the scope of the plasma generation region in the center axial dimension

Claim Rejections - 35 USC § 103

- 7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
- 8. Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Sato Noriyoshi et al (JP5-354023 IDS reference). Sato Noriyoshi et al does not explicitly describe:
 - xii. Both of the two walls (items 5, 1; Figure 5) connected to a reference potentialA person of ordinary skill in the art at the time the invention was made would find it obvious to change the potential applied to the confining plasma surfaces. Motivation is drawn from varying the plasma volume geometry and impinging energy of the ions resulting in higher quality films. The obviousness of process parameter (voltage in this instance) variations is supported:

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9.

CAUSE EFFECTIVE VARIABLES

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

CAUSE EFFECTIVE VARIABLES - Routine experimentation

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as [spray droplet size] through routine experimentation in the absence of a showing of criticality in the claimed size. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, USPQ 233 (CCPA 1955).

CRITICALITY OF PROCESSING PARAMETERS

If Applicant can establish a showing of criticality in the claimed pressure, the rejection will be withdrawn. See *Ex parte Khusid*, 174 USPQ 59 ("Where the principal difference

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between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon Applicant to establish criticality of that difference"). This decision is clearly analogous to pressure differences and other process parameters.

10. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-9, 16-18 above, and further in view of Kinoshita et al. Sato Noriyoshi et al does not describe

- xiii. A controller that controls the magnitude of high frequency electric power applied to the discharge electrode from the high frequency electric power supply
- xiv. A controller that controls the magnitude of high frequency electric power output from the first and second high frequency electric power supplies
- xv. A controller configured so that the ratio of the magnitude of high frequency electric power output from the first and second high frequency electric power supplies is a predetermined value

Kinoshita et al describes

- xvi. A controller (27, column 14, lines 12-18, 25-29) that controls the magnitude of high frequency electric power applied to discharge electrode (21, 22, column 14, lines 12-18, 25-29) from the high frequency electric power supply

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- xvii. A controller (27, column 14, lines 12-18, 25-29) that controls the magnitude of high frequency electric power output from the first (item 16, Figure 7; column 9, lines 45-50) and second (item 26, Figure 7; column 9, lines 45-50) high frequency electric power supplies
- xviii. A controller configured so that the ratio of the magnitude of high frequency electric power output from the first and second high frequency electric power supplies is a predetermined value (column 12, lines 43-67)

A person of ordinary skill in the art at the time the invention was made would find it obvious to consider Kinoshita et al's reference potential points to be an obvious extension of the Sato Noriyoshi et al (JP5-354023 IDS reference) apparatus. Motivation for combining the above references is drawn to sustaining, according to Kinoshita et al, "plasma uniformities" (column 12, lines 43-67).

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Smesny et al (U.S.Pat. 5,444,637). Sato Noriyoshi et al does not specifically address position adjustment means for adjusting positions of plasma confining walls. Smesny et al describes an integrated circuit dry etch chamber (item 90, Figure 5; column 12, lines 11-28). Specifically, Smesny et al describe a *position adjustment means for adjusting positions of a movable first electrically conductive wall electrode* (item 92, Figure 5; column 12, lines 10-15).

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A person of ordinary skill in the art at the time the invention was made would find it obvious to implement the enhancements of position adjustment means for adjusting positions of plasma confining walls as taught by Smesny et al to the Sato Noriyoshi et al apparatus. Motivation is directed, according to Smesny et al, for optimal etching conditions (Column 12, lines 50-55).

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato Noriyoshi et al (JP5-354023 IDS reference) as applied to claims 1-8, 16-18 above, and further in view of Inazawa et al (U.S.Pat. 5,595,627). Sato Noriyoshi et al does not precisely describe a wall functioning as a gas diffusion plate. Inazawa et al describe the *upper first electrically conductive wall electrode 40* has a hollow interior, and a large number of gas diffusion holes 42 are formed in its entire surface opposite to the wafer W. a dispensing plate (not shown) is disposed in the *upper first electrically conductive wall electrode 40*. An etching gas fed into the *upper first electrically conductive wall electrode 40* through a gas feed pipe 44 is uniformly sprayed into the processing chamber 16 through the gas diffusion holes 42 (column 4, lines 56-65).

A person of ordinary skill in the art at the time the invention was made would find it obvious to consider the wall functioning as a gas diffusion plate as taught by Inazawa et al to be an obvious improvement over the Sato Noriyoshi et al plasma reactor. Motivation for combining the above references is drawn from the added advantage of evenly distributing the process gas, as opposed to the Sato Noriyoshi et al introduction method (all Figures), introduced into the process chamber over

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>The rationale supporting an obviousness rejection may be based on common knowledge in the art or "well - known" prior art. The examiner may take official notice of facts outside of the record which are capable of instant and unquestionable demonstration as being "well - known" in the art. In re Ahlert , 424 F.2d 1088, 165 USPQ 418, 420 (CCPA 1970) (Board properly took judicial notice that "it is common practice to postheat a weld after the welding operation is completed" and that "it is old to adjust the intensity of a flame in accordance with the heat requirements."). See also In re Seifreid , 407 F.2d 897, 160 USPQ 804 (CCPA 1969) (Examiner's statement that polyethylene terephthalate films are commonly known to be shrinkable is a statement of common knowledge in the art, supported by the references of record.).

Response to Arguments

13. Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion


14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a

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general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached then please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.


GREGORY MILLS
PRIMARY EXAMINER